The Effects of Trade on Unemployment: Evidence from 20 OECD countries

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Abstract

This study empirically investigates if international trade has an impact on aggregate unemployment in the presence of labour market institutions. Using data for twenty OECD countries for the years 1961-2008, this study finds that an increase in trade leads to higher aggregate unemployment as it interacts with rigid labour market institutions, whereas it may reduce aggregate unemployment if the labour market is characterised by flexibility. In a country with the average degree of the labour market rigidities, an increase in trade has no significant effect on unemployment rates.

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1 Introduction

The effects of globalisation have received great attention in economic research. In the last two decades, economists have studied how increases in trade, foreign direct investments, and immigration can affect labour market outcomes such as income distribution and unemployment. The theoretical models and the empirical investigations in these topics are so voluminous that frequent literature surveys are required to grasp the updated research findings.

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One of the very recent questions in focus is whether, and if so how, the impact of trade on labour market outcomes depends on labour market institutions. Krugman (1995) acknowledges that trade seems to have reduced the relative wage of low-skilled workers in the United States and the United Kingdom, whereas in most European countries, trade seems to have resulted in higher unemployment. Differences in labour market institutions are emphasized as one of the main factors for the divergent effects of trade in these countries.

The aim of this study is to empirically investigate the link between trade and aggregate unemployment in the presence of labour market institutions. First, I analyse whether international trade has any direct effect on aggregate unemployment. Second, I explore how the interaction between trade and labour market institutions may affect the unemployment rate. The analysis is based on cross-country panel data for twenty OECD countries from the 1960s to the 2000s. In general, cross-country data analyses may involve some weakness. Nevertheless, it is a plausible method for empirically identifying the general equilibrium evidence of how international trade is related to the level of aggregate unemployment, especially when one wants to take differences of labour market institutions across countries into consideration.

Besides looking at the effects of total trade and total imports, I also investigate whether the imports from low-income economies will have any distinctive effects on the aggregate unemployment rate as compared to imports from high-income economies. Since the size of trade is likely to be endogenous, I use a set of constructed import and export variables, respectively, as instruments for the trade variables.

The following is found in this study. First, when the interaction between trade and labour market institutions is accounted for, trade is likely to lead to an increase (decrease) in aggregate unemployment in countries with relatively rigid (flexible) labour market institutions. Second, as only the direct effect of trade is considered,

an increase in imports from high-income economies leads to higher unemployment, while total trade, total imports, or imports from low-income economies tend to have no significant effect on the unemployment rate. The result of the direct effect of trade on the unemployment rate should, nevertheless, be considered with caution, since the model with only the direct effect of trade can be misspecified.

In general, previous empirical studies have found that the employment effects of trade in OECD countries are weak or their magnitudes are small. Just to name a few studies, Wacziarg and Wallack (2004), who used data for the manufacturing sector, found that no data support the hypothesis that trade liberalisation leads to intersectoral labour shifts. Similarly, Dewatripont, Sapir and Sekkat (1999) found no significant hardship from LDC import penetration in terms of long-term unemployment at the individual or sectoral level in four European countries. Revenga (1997) concludes that there is no reduction in overall firm-level employment due to a reduction in the tariff level. Papageorgiou, Michaely and Choksi (1991) acknowledge from the nineteen case studies of trade liberalisation episodes that there are no significantly large employment effects following trade liberalisation.

Studies that analyse the impact of trade on aggregate unemployment are scarce, however. Moreover, the previous studies in the trade literature often neglect the importance of labour market institutions for understanding the impact of trade on labour market outcomes. This is surprising, since differences in labour market institutions are known to be one of the important factors in explaining unemployment.

Dutt et al. (2009) analyse the effect of trade policies on the aggregate unemployment rate in a heterogeneous group of countries. They find robust evidence that open trade policies lead to lower unemployment. In contrast to their work, the present paper concentrates on twenty relatively homogenous OECD countries. This makes it more suitable for comparing the extent of labour market institutions, and improves

the analysis by having panel data over 40 years, which can control for unobservable heterogeneity among countries. In addition, Dutt et al. (2009) account for the extent to which labour market institutions, i.e. employment law index, only serve as a control, while the current paper focuses on the role of different labour market institutions as it interacts with trade in explaining aggregate unemployment.

The working paper by Boulhol (2008) shares a similar spirit as the present study. He also stresses the importance of labour market institutions when it comes to the effect of trade on unemployment. As is done in the present study, Boulhol accounts for the interaction between labour market institutions and trade. However, the present paper also investigates if the effects of trade on aggregate unemployment are different across types of trading partners by separating imports from low-income economies from imports from high-income economies. Moreover, this paper uses trade instruments to alleviate the potential endogeneity problems of the trade variables.

The paper is organised as follows. In the next section, I provide the theoretical backgrounds for the study. Section 3 presents the econometric model and the data. Section 4 discusses the baseline estimation results. In section 5, I discuss the robustness of the findings. Section 6 concludes the paper.

2 Theoretical Background

The first part of this section presents previous theoretical studies that have explored the direct effect of trade on unemployment. The second part presents the theoretical studies that have analysed how trade may affect unemployment through the interaction with labour market institutions.

2.1 Trade and Unemployment

There is a number of theoretical models that analyse the effect of trade on aggregate unemployment. However, there is no consensus on whether an increase in trade will lead to a higher or lower aggregate unemployment rate. The general intuition for the negative association between trade and unemployment is that trade improves the economy-wide value of the marginal product of labour. Dutt et al. (2009) argue that trade openness, which improves aggregate labour productivity, will reduce unemployment as it leads to more job creation and job search. Similarly, based on their search-unemployment model with heterogeneous firms, Felbermayr et al. (2011) also argue that trade liberalization reduces unemployment as long as it improves aggregate productivity. This happens through crowding-out of the least productive firms and labour reallocation into more productive firms. Matusz (1996) also agrees with the fact that trade may improve economy-wide productivity and thereby reduce the unemployment rate. The reason is that trade results in a greater division of labour due to an increase in the variety of available intermediates.

In contrast, Helpman and Itskhoki (2010) argue that lower trade barriers can lead to an increase in unemployment. This follows as reduced trade barriers improve the profitability of exporting firms, thus leading to an expansion of the trading sector. Unemployment will increase when workers reallocate towards the exporting sector, if this sector is to a larger extent characterized by labour market frictions. Janiak (2006) also shows that higher trade exposure is associated with a higher level of equilibrium unemployment. The reason is that job destruction by the exit of small low-productivity firms exceeds job creation by large high-productivity firms as large firms will extract higher rents by limiting the amount of job creation.

There are also theoretical studies that conclude that the effect of trade on ag-

gregate unemployment is ambiguous. Sener (2001) and Moore and Ranjan (2005) argue that trade liberalization leads to an increase in the unemployment of unskilled workers, but has theoretically ambiguous effects on aggregate unemployment. The former study argues that trade liberalization increases the profitability of innovation activity by raising the profit margin of the exporting firms. Consequently, more firms will be engaged in R&D and there is an increase in the demand for skilled labour. On the other hand, the higher frequency of innovations increases the turnover rate of unskilled workers by speeding up the creative destruction process, and increases the frictional unemployment rate of unskilled workers. Hence, the effect of trade liberalization on the aggregate unemployment rate is ambiguous. For similar reasons, Moore and Ranjan (2005) argue that aggregate unemployment is likely to decrease in a skilled-labour abundant country and increase in an unskilled-labour abundant country.

2.2 Interaction between Trade and Labour Market Institutions and Unemployment

Besides the direct effect of trade on aggregate unemployment, this paper explores how so-called rigidities imposed by labour market institutions can contribute to this effect. One of the earliest theoretical studies that analyses how the interaction between trade and labour market institutions can affect unemployment is Davis (1998). He argues that the opening of international trade can raise European unemployment significantly due to Europe's commitment to maintain the minimum wage. Based on the stylized model of minimum wage Europe and flexible wage U.S., he argues that the product price, which reflects the European minimum wage, defines the world

trade price.[1] As trade commences, the U.S. wage level will gradually increase to the European wage level, while the U.S. can maintain the zero unemployment rate due to their flexible wage. He acknowledges that Europe, in fact, bears all the costs of a trade shock such as a sudden increase in imports from developing countries in the form of unemployment, while the U.S. labour market is fully insulated as a result of the European rigidity.

Boulhol (2008) shows that Davis' (1998) main idea can be generalized to a broader set of labour market institutions than just minimum wage setting. Labour market institutions, such as minimum wages, unemployment benefits, union density, employment protection legislation, etc. can be viewed as devices to push up the wage costs at the lower end of the wage distribution. Labour market institutions affect the cost of labour and thus, relative factor and good prices. Therefore, imports from low-income economies are potentially expected to be more likely to lead to higher unemployment.

Moore and Ranjan (2005) argue that an economy with a greater degree of labour market rigidity will experience a greater quantitative effect of globalisation on unemployment. Thus, these studies argue that labour market institutions may amplify the increase in unemployment as a consequence of more trade.[2]

In contrast, Helpman and Itskhoki (2010) show that lower trade barriers can increase unemployment in the country with the relatively more flexible labour market, but potentially reduce unemployment in the country with the relatively more flexible labour market. Unemployment increases in the more flexible country as workers are reallocated towards the expanding sector where labour market frictions are assumed to be higher. This may also be the case for a country with a more rigid labour

[1] This holds as long as Europe is not completely driven out of the industry that uses the low-skilled worker whose wage is bound by the minimum wage.

[2] Moore and Ranjan (2005) define labour market rigidity as any factor that tends to increase the reservation utility of workers.

market. However, if a country has a very rigid labour market, the trading sector in this country will start to contract, instead of expand, as trade increases. This leads to a lower unemployment rate in the country with the rigid labour market as workers are reallocated towards the non-trading sector which is assumed to have no labour market frictions.

The empirical evidence that depicts how the interaction between trade and labour market institutions affects aggregate unemployment is limited. The only exception is Boulhol (2008).[3] His empirical investigation finds evidence for the interactions between increases in bilateral trade and relative labour market institutions having raised aggregate unemployment rates. He argues that Canada, where labour market institutions are fairly flexible in absolute terms, can be negatively affected because its main trading partner, the U.S., is even less regulated. Germany, whose labour market is highly regulated in absolute terms, tends to be moderately affected by trade, since its major trading partners, i.e. other European countries, are even more regulated.

3 Empirical Setup and Data

3.1 Empirical Setup

The aim of this study is to identify the effects of trade on the aggregate unemployment rate in the presence of labour market institutions. First, I test if the size of trade is directly correlated with the unemployment rate. Second, I test if the interaction between trade and the degree of labour market institution is significantly associated with the unemployment rate. The baseline econometric model of the reduced-form unemployment rate includes the explanatory variable that is related to the extent of

[3]For empirical studies that analyse how the interaction between shocks and institutions can affect unemployment, see *inter alia* the influential study by Blanchard and Wolfers (2000).

international trade, labour market institutions and macroeconomic controls. Since a measure of labour market institutions may covary with other institutions within a country, this study analyses various institutions separately.

Equation (1) is the econometric specification for the unemployment rate to identify the direct effect of trade.

$$U_{it} = \alpha(trade_{it}) + \beta(LMI_{it} - \overline{LMI}) + \sum_{s} \gamma^{s}(control_{it}^{s}) + c_i + \delta_t + u_{it}, \qquad (1)$$

where i and t denote country and time, respectively. The dependent variable U is the standardized aggregate unemployment rate. The explanatory variable, *trade*, is the size of total trade, total imports, imports from low-income and high-income economies as ratios of GDP, which are used alternately. $(LMI_{it} - \overline{LMI})$ denotes the centred measure of the labour market institutions, i.e. stringency of employment protection, generosity of unemployment benefits, the power of trade unions, and the degree of coordination in the wage bargaining process, where $\overline{LMI}$ is the sample mean of labour market institutions across countries and over time. *control* are the control variables, i.e. the population aged between 15 and 64 as a share of the total population and GDP per capita. c_i and δ_t denote country- and time-fixed effects, respectively, and u_{it} is an error term. This study will test if a, the coefficient of the direct effect of trade on the unemployment rate, differs significantly from zero.

Equation (2) analyses the effect of the interaction between trade and labour market institutions on the unemployment rate. The interaction term is defined as the product of the trade variable and the centred labour market institution variable.

$$U_{it} = \alpha(trade_{it}) + \beta(LMI_{it} - \overline{LMI}) + \theta(LMI_{it} - \overline{LMI})(trade_{it}) + \sum_{s} \gamma^{s}(control_{it}^{s}) + c_i + \delta_t + u_{it}. \quad (2)$$

The total effect of a marginal increase in trade on aggregate unemployment is $\alpha + \theta(LMI_{it} - \overline{LMI})$. Thus, whether trade actually increases or decreases aggregate unemployment does not only depend on the signs of the coefficient estimates α and θ, but also on whether the country's labour market institution is relatively rigid or flexible. The coefficient on the trade variable α is the so-called "constituent" effect of trade and can be interpreted as the marginal unemployment effect of trade, when the labour market institution is at its sample mean. The coefficient on the product term θ depicts the extent of the additional effect of trade on aggregate unemployment depending on the extent of the country's labour market institution.

The current study will investigate whether the total effect of trade on aggregate unemployment differs significantly from zero by identifying the signs of the constituent effect α and the interaction effect θ of trade. A positive θ implies that an increase in international trade gives rise to higher unemployment in the relatively rigid labour market country, whereas an increase in trade will reduce unemployment in the relatively flexible country. The combinations of a positive α and a negative θ, or of a negative α and a positive θ, imply that rigidities in the labour market may mitigate the effect of trade on aggregate unemployment. Then, Davis' (1998) theoretical model indicates the positive sign on the interaction term θ, where an increase in trade is expected to raise unemployment in the country that is committed to the minimum wage. In contrast, Helpman and Itskhoki (2010) argue for the negative sign on the interaction term θ, implying that trade leads to higher unemployment in the relatively

flexible country, but to lower unemployment in the relatively rigid country.

3.2 Data

This section discusses the data.[4] In the baseline regressions, I analyse to which extent an increase in international trade affects the aggregate unemployment rate using the cross-country panel data of twenty OECD countries over the period 1961-2008.[5] The annual data are arranged to five-year averages.[6] Using five-year averages of the data helps us smooth out short-term fluctuations and highlight the long-term development of the variables, in which this study is interested. Moreover, it can reduce some measurement error that might be problematic for the indices of labour market institutions and other proxies. The data are analysed by the fixed-effects model. Besides twenty country dummies, I use three additional dummies for fixed effects of Finland, Germany, and Sweden since 1991.[7]

The dependent variable is the standardised aggregate unemployment rate, which is unemployed workers as a share of the civilian labour force of the age group 15-64. Figure 1 shows the development of the unemployment rate of selected countries over the last fifty years. The U.S. had the highest unemployment rate from the second half of the 1950s until the end of the 1970s. After that, the unemployment rates of the U.K. and the European countries surged to above 8%. Since the early 2000s, the average unemployment rates tend to converge to between 4% and 7%.

[4] Detailed information and the source of the data are found in Appendix B.

[5] The twenty OECD countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

[6] The first observation is the unweighted average of the annual data between 1961 and 1965. The last observation is the average of the annual data between 2001 and 2007.

[7] This method was first used in Bassanini and Duval (2006) as a way of solving the significant historical events such as the fall of the Soviet Union, which may have affected Finland, the unification of Germany, and the large banking crisis in Sweden in the early 1990s. However, using twenty-three country dummies instead of twenty does not notably change the estimates.

The explanatory variables are a country's total trade (*tottrade*), total imports (*totimport*), imports from low-income economies (*importlow*) and imports from high-income economies (*importhigh*), all as ratios of GDP. Total trade is found to be negatively correlated with aggregate unemployment in the cross-sectional analysis of 55 countries by Dutt et al. (2009). However, the simple covariance matrix that is adjusted for the panel data shows that total trade is positively correlated with the unemployment rate; see Table 2. Small European countries such as the Netherlands and Belgium have the largest trade as a ratio of GDP. The U.S. has the lowest, which does not exceed 20% of its GDP except in the last decade; see Figure 2. Apart from a few exceptions, total trade as a ratio of GDP has been increasing over time for all countries. Figure 6, a simple scatter graph, depicts a positive relation between the total trade ratio and the unemployment rate.

The development of total imports closely follows total trade due to the balanced trade in most OECD countries; see Table 2 and Figure 3. The data of imports from low- and high-income economies, respectively, come from the COMTRADE database and cover the years 1962 to 2000. The low-income economies are defined as all countries except the OECD and the OPEC member countries. The high-income economies are defined as the OECD countries. The largest proportion of total imports is imports from high-income economies; see Figure 4 and Figure 5. In the average European countries, only between 6% and 10% of total imports are from the low-income economies. Imports from low-income economies in the U.S. and Japan are even smaller such that they hardly exceed 5% of the GDP of these countries. The U.K. has the highest proportion of imports from low-income economies since the 1960s, but it falls sharply until the mid 1980s. However, it tends to have been increasing in most of the twenty OECD countries since the 1990s. Figures 7 and 8 are the scatter graphs between imports from low-income economies and high-income

economies, respectively, and the aggregate unemployment rate. There is a tendency to a positive association between these two types of trade and unemployment, though their magnitudes are fairly small.

Nevertheless, the trade variables are likely to be endogenous. Suppose that high unemployment makes voters support protective trade policy through increased taxes on imported goods, which would lead to a decrease in international trade. Then, the OLS estimates of both a direct effect and an interaction with trade would be negatively biased. If trade is, in fact, negatively correlated with unemployment as found by Dutt et al. (2009), the absolute size of IV-estimates on these effects would be smaller. Furthermore, suppose that there are two countries that are identical in all aspects except that one country has extensive labour market institutions that protect workers in case of job loss and the other has no labour market institutions that provide security during unemployed. In this case, the voters in the country with extensive labour market institutions would have less incentives to support the protective trade policy as compared to the counterpart with no security during unemployment. As a result, the country with lax labour market institutions would experience a larger decrease in trade in case of high unemployment. Estimating the interaction between trade and labour market institution using the OLS could therefore be downward-biased as compared to that obtained by the IV.

Hence, this study uses instrumental variables for trade. In the baseline regressions, the export instrument (*exportinstr*) and the import instrument (*importinstr*) which are constructed by the author are used for all **four** trade-related variables. The export and import instruments, respectively, are constructed as

$$\begin{aligned} (tradeinstr)_{jt} &= \sum_i \left[\left(\frac{trade_{it}}{trade_{i,1962}} \right) \cdot (trade\ share_{ij,1962}) \right], \\ \text{where } trade &= \{export, import\}, \end{aligned}$$

and i, j, and t denote sector, country, and time, respectively. $trade_{it}$ means global exports or imports in sector i at time t. Equivalently, $trade_{i,1962}$ is global exports or imports in sector i at the base year, 1962.[8] $(trade\ share_{ij,1962})$ is sector i's share of total exports or imports in country j at the base year. The instruments are based on the idea that no single country is sufficiently large to have a substantial impact on global country trends. Moreover, the changes in transportation costs or trade liberalization affect each sector differently. Thus, the extent of how a country is affected by globalisation does not only depend on to what extent each sector is affected by globalisation, but also on what a country's trade consists of. These constructed variables are proper instruments, since the impact of the development of transportation method or globalisation on each sector can hardly be argued to be correlated with aggregate unemployment, but it may be strongly associated with the volume of total trade, total imports, or imports from low- and high-income economies, respectively.

The R.H.S. variables that measure the structure of labour market institutions (LMI) are the stringency of employment protection (epl), generosity unemployment benefits (brr), unionisation rate ($udnet$) and coordination/centralisation in wage bargaining (cow). The stringency of employment protection is the employment protection legislation index by OECD with the range [0, 2] increasing with strictness. The generosity of the unemployment insurance system is captured by the unemployment benefit replacement rates by OECD. This institution is known to affect the supply of labour by influencing the reservation wages of the unemployed. The unionisation rate of labour markets is given as the net union density rate constructed by OECD and extended by Visser (2006). The structure of collective wage bargaining is given as the bargaining coordination index with a range [1,3] increasing with the strength

[8] The sectoral COMTRADE data start in the year 1962.

of coordination. To reduce the potential endogeneity problem of these institutions, each labour market institution of the interaction term is instrumented by the initial value of the respective labour market institution, *LMI60*.[9]

Finally, the macroeconomic control variables are GDP per capita and the working age population rate. GDP per capita is a measure of the level of economic development and controls for the effect of the business cycle. Fagerberg et al. (1997) argue that regions with a low level of GDP per capita tend to have higher unemployment. The working age population rate is measured as the size of the population at ages 15-64 as a share of the total population. Japan has the highest working age population rate over all periods. Table 1 provides the summary statistics of all variables.

4 Results

4.1 Baseline Estimation Results

This section discusses the baseline regression results.[10] The effects of trade on unemployment with different labour market institutions are presented in separate tables; see Tables 3-6. In each table, the effects of four trade variables are presented. In the first four columns, trade is measured as total trade and total imports relative to GDP. In the last four columns, imports from low-income economies and high-income economies, respectively, are considered. Column (1) is the estimates of the baseline specification (1) where only the direct effect of trade and the control variables are included. Column (2) presents the estimates of the baseline specification (2) where the interaction effect is also involved. The results are estimated by the IV-method where

[9]The endogeneity of labour market institutions is extensively discussed in several studies, i.e. Agell (2002) and Saint-Paul (1996).

[10]The baseline equations are estimated by the fixed-effects model, where the country-fixed effect c_i is allowed to be correlated with other regressors, which commonly occurs in this type of studies.

the trade variables are instrumented by the constructed export/import instrument. The interaction between the trade variables and labour market institutions is instrumented by the product of the constructed instruments and the initial values of the respective labour market variable. The OLS estimates of two baseline specifications are presented in columns (1) and (2) in Table 8 in Appendix A and Table A1-Table A3 in the separate appendix as part of the sensitivity analysis.

Table 3 presents the baseline IV-estimations that show how trade may affect the aggregate unemployment rate when the strictness of employment protection legislation is involved. High values on the F-statistics of the first-stage regressions and the Hansen's J-statistics with high P-values indicate that the constructed instruments, *exportinstr* and *importinstr,* are proper.[11]

Imports from high-income economies are significantly positive, when only the direct effect of trade is considered as in the baseline equation (1). It implies that as imports from high-income economies as a ratio of GDP increase by one percentage point, the aggregate unemployment rate will increase by about 0.6 of a percentage point. As specification (2) is considered, the estimate of the interaction term is highly significant and positive for all trade variables. It indicates that the size of the trade effect on unemployment increases when a country's employment protection is more strict. However, none of the constituent effects of the trade variables are significantly different from 0 in this specification. Trade may not have any significant impact on aggregate unemployment if the country's employment protection is on the average. Trade is likely to raise (reduce) unemployment as the country's employment protection is relatively more stringent (lax). The magnitude of the trade effect is the largest when imports from low-income economies are used, implying that an increase

[11] One exception where the first-stage F-statistic does not exceed the critical value 10 is when imports from low-income economies are used in column (1).

in imports from low-income economies as a ratio of GDP by one percentage point will increase the unemployment rate by 3.3 percentage points for the country for which the centred employment protection index is 1. For example, for Portugal in the years 1981-85 (centred $epl \approx 0.76$), an increase in its imports from low-income countries as a ratio of GDP by one percentage point raises the unemployment rate by approximately 2.5 percentage points, while that for the U.S. in the most recent years (centred $epl \approx -0.57$) can reduce the unemployment rate by approximately 1.9 percentage points. The magnitude of the IV-estimates **is** larger than that of the OLS-estimates, which will be further discussed in the next section.

Table 4 shows the baseline IV-estimation results when the generosity of the unemployment benefit is involved. The estimate on imports from high-income economies is significantly positive in column (1) as only the direct effect of trade is introduced. This implies that, on average, an increase in imports from high-income economies as a ratio of GDP by one unit raises the unemployment rate by 0.4 percentage points. As specification (2) is considered, the interaction terms between the trade variables and the unemployment benefit continue to be significantly positive except when imports from low-income economies are included. The estimate on the interaction term in the last column 0.018 implies that an increase in imports from OECD countries by one percentage point can reduce the unemployment rate by approximately 0.43 percentage points for a country like Portugal, where the unemployment benefit index is the lowest. For Denmark, whose unemployment benefit is the highest, in the second half of the 1990s an increase in imports from OECD countries by one percentage point can raise the unemployment rate by about 0.67 percentage points.

When the strength of trade unions is used as a measure of labour market rigidity, the pattern continues for fewer trade variables; see Table 5. As specification (1) is tested, the direct effect of imports from high-income economies is still positive.

When the interaction term is included, the direct effect of imports from low-income economies is significantly positive. Increasing imports from low-income economies in a country with relatively strong trade unions can raise the unemployment rate.

When the degree of centralisation in the wage bargaining process is considered in Table 6, the signs of the estimates are consistent with the previous estimates, but the level of significance increases. In the specification that includes the interaction term, the estimates of total trade as well as imports from high-income economies are positive at the 10% significance level.

Throughout the baseline regressions**,** GDP per capita is negatively associated with unemployment. This shows the business cycle effect, which implies that more affluent countries or periods tend to have lower unemployment. Meanwhile, the share of the working age population does not explain much of the variation in the aggregate unemployment rate.

The results from the baseline models estimation can be summarised as follows. First, when only the direct effect of trade is specified, imports from high-income economies are likely to increase aggregate unemployment, while imports from low-income economies show the opposite direction in a few regressions. This finding is in line with that of Dutt et al. (2009). However, the significant interaction terms indicate that the model with only the direct effect of trade may have been misspecified.

Second, when both the constituent effect and the interaction effect of trade are modelled in specification (2), there is clear evidence that an increase in trade is likely to lead to higher (lower) aggregate unemployment as it interacts with relatively rigid (flexible) labour market institutions. This finding roughly confirms Davis' (1998) theory that unemployment in the rigid north country is likely to increase as it trades with the southern or the northern counterpart. The pattern is most significant when employment protection is involved followed by the generosity of the unemployment

benefit. The constituent effects of trade are mostly insignificant, which implies that for a country with the average labour market institution**,** trade has no effect on the unemployment rate. Table 7 summarizes how trade may affect the unemployment rate depending on a country's labour market institutions.

In addition, the size of the effect of imports from low-income economies in increasing unemployment rates when interacted with each labour market institution is larger than that of imports from high-income economies. This is due to the fact that labour market institutions tend to raise the wage costs at the lower end of the wage distribution and therefore affect the labour demand of low-skilled workers who are readily replaced by imports from low-income economies.

Finally, the significant interaction terms indicate that the baseline equation (2) is more properly specified than equation (1). The estimates obtained by the baseline specification (1) can thus be biased. Hence, the empirical evidence in Dutt et al. (2009), where only the direct effect of trade or trade policy is considered, might suffer from the bias of the omitted interaction variable.[12] In contrast with Boulhol (2008), the current study includes the constituent effect of trade, even though it turns out to be insignificant in most of the equations.[13]

4.2 Simulation of the Baseline Results

This section presents simulations illustrating how the aggregate unemployment rate changes as the volume of imports from low-income economies varies in different countries. It is particularly interesting to look at this, since there has been a dramatic

[12] However, including the interaction between trade and the structure of labour market institutions for a larger set of countries might be difficult since the panel data of labour market institutions for non-OECD countries are hard to obtain.

[13] Although most of the estimates on the trade variables are insignificant, these terms should be included, since the insignificance, in fact, only means that the effect of trade on aggregate unemployment is likely to be zero when the labour market institution is on its sample average. Besides, it is a better strategy than excluding a potentially important variable.

increase in imports from low-income economies, especially from China, in the two recent decades. According to the CRS report, China is the second largest source of U.S. imports of merchandise ($243 billion in 2005) after Canada ($287 billion). Moreover, China runs a trade surplus with the world's three major economics centres, the U.S., the EU-15 and Japan (Lum and Nanto, 2007). To identify how the trade effect on unemployment is affected by the structure of labour market institutions, the unemployment rate of three countries with a fairly different stringency of employment protection (EPL) for the years 1991-1995 is simulated; the U.S with the lowest epl-index, Sweden with the sixth highest epl-index and the unweighted average of Portugal, Italy, and Spain (IPS), whose epl-indices are the highest among the twenty countries. Except for a variation in the size of imports from low-income economies as a ratio of GDP around the actual value, all other variables are the same as what is found in the original data.

Figure 9 presents the simulated unemployment rates with a 95% prediction interval for the U.S. The actual size of imports from low-income economies is 3.15% of its GDP in the years 1991-1995 and the unemployment rate is about 6.6%. As the U.S. imports from low-income economies increase from the actual level to 3.5% of the U.S. GDP, the unemployment rate decreases from 6.59% to 5.46%. Figure 10 shows the simulated unemployment rates of Sweden where employment protection is relatively stringent in the same period. When its imports from low-income economies increase from the actual level of 2.46% to 4%, the unemployment rate is predicted to decrease from 7.52% to 7.36%. Finally, Figure 11 shows the simulated unemployment rates of the hypothetical country (IPS), which is the unweighted average of Italy, Portugal, and Spain, where the epl-indices are the highest. The slope of the graph is positive indicating that an increase in imports from low-income economies leads to a higher unemployment rate. In particular, as its imports from low-income

economies increase from the actual value of 2.74% to 3.25%, the unemployment rate is predicted to increase from 12.5% to 13.06%.

This simulation exercise points out the baseline findings from the empirical analysis in the previous section. Countries with high stringency in employment protection can experience a surge of unemployment rates as there is an increase in imports from low-income economies such as China. In contrast, a country with low employment protection such as the U.S. may instead experience a decrease in the unemployment rates. In countries with moderate employment protection, the magnitude of the effect of imports from low-income countries might be fairly small.

5 Sensitivity Analysis

This section presents the sensitivity analysis. To check the robustness of the baseline estimation results, different specifications of the unemployment equations (1) and (2) and choice of the data are tested. Table 8 presents the sensitivity analysis when the stringency of employment protection is involved. Tables A1-A3, which are available in the separate appendix, contain the sensitivity analysis results when the measures of generosity of unemployment benefit, strength of trade unions, and centralisation in wage bargaining are included. In part A of each table, trade is measured as the sum of imports and exports, in part B, the size of total imports is included, in part C and part D, respectively, the size of imports from low-income and high-income economies, respectively, is included.

Columns (1) and (2) in part A in Table 8 are the OLS estimates of baseline equations (1) and (2). The interaction between total trade and employment protection is still highly significant and positive. The size of the trade effect by OLS is about half of that by the IV-estimation. This implies that the OLS estimates of the effect of

trade on unemployment are likely to be negatively biased which, in turn, reveals that unemployment and trade are, in fact, negatively correlated. In columns (3) and (4), an additional set of instruments, international transport cost, is introduced besides the constructed export/import instrument for the trade variable.[14] Since these additional instruments are only available over the period 1973-2005, the observations of the 1960s are dropped. The first-stage F-statistics as well as the Hansen J-statistics imply that these two sets of the instruments are proper. The interaction term is still positive in the high confidence level. In contrast with the baseline estimates, the coefficient estimates on employment protection became significantly negative, which indicates that the stringent employment protection leads to a lower aggregate unemployment rate. However, this change is due to the fact that the observations in the 1960s are excluded rather than to an inclusion of the additional set of instruments.

When the highly significant control variable, GDP per capita, is excluded from the baseline IV-regression with the interaction term in column (5), the interaction between total trade and employment protection is still highly positive. Employment protection is once more negatively correlated with aggregate unemployment. This indicates that the baseline results do not depend on the effect of the business cycle on unemployment rates. Moreover, the significance of the interaction term is robust to dropping the observations of Portugal and Spain, which have some missing values in the 1960s and the 1970s due to the political turbulence. This implies that the positive interaction effect does not seriously depend on a few outliers or missing observations; see column (6) in Table 8.

Part B in Table 8 presents the sensitivity analysis results when the size of total imports and the stringency of employment protection are used. The baseline IV-

[14]The international transport costs are the country- and time-specific international transport costs of three methods of transportation, road (tr1), maritime (tr2) and air (tr3), which are estimated by Golub and Tomasik (2008).

estimation showed that the interaction with employment protection is significantly positive in the highest level of confidence. The OLS estimation of the baseline models suggests the same direction but the magnitude is now smaller; see column (2), Part B, Table 8. The negative biasedness of the OLS estimates suggests that unemployment rates and total imports are likely to be negatively correlated. When the additional set of the instruments is introduced, the interaction effect is still significantly positive. In addition, the estimates on employment protection also become significant, which implies that strict employment protection is associated with a lower level of unemployment; see columns (3) and (4), Part B, Table 8. The interaction term is robust to dropping the highly significant control variable, GDP per capita, in column (5) and dropping the observations of Portugal and Spain in column (6).

Parts C and D in Table 8 present the equivalent sensitivity analysis results when the size of imports from low- and high-income economies, respectively, is used as the trade variable. The effect of the interaction between imports from low-income economies and employment protection is robust throughout the tests. The interaction between imports from high-income economies and employment protection is robust to the omission of the control variable, GDP per capita, and the elimination of the observations of Portugal and Spain; see columns (5) and (6), Part D, Table 8.

The sensitivity analysis suggests the following. First, the interaction between the trade variable and employment protection is highly robust. The positive interaction effect implies that an increase in trade in the country with relatively strict employment protection leads to an increase in unemployment. Second, the positive direct effect of imports from high-income economies is fragile. However, most of the estimates indicate that trade is associated with lower unemployment with the exception of when imports from high-income economies are involved. In addition, the OLS estimates are downward biased as compared to the baseline IV-estimates. This is

evidence that the unemployment rate and the trade variables are, in fact, likely to be negatively associated. Finally, these implications are the strongest when the stringency of employment protection is involved as compared to other measures of labour market institutions. In summary, there is substantially robust evidence that trade is likely to raise (reduce) unemployment as it interacts with relatively extensive (lax) labour market institutions.

6 Conclusion

This study begins with the popular belief that globalisation and increasing international trade with the developing economies in particular may have a negative impact on the labour market in developed countries. Although this question has been explored in several studies using the data of different categories of labour, industry, or sector, few studies have been made to analyse the impact of trade on aggregate unemployment. The purpose of this study is to provide empirical evidence of whether international trade has any significant impact on aggregate unemployment in the presence of labour market institutions. Using data for twenty OECD countries and the years 1961-2008, this paper investigates two hypotheses; that trade has a direct effect on the aggregate unemployment rate and that trade in interaction with labour market institutions has an effect on aggregate unemployment. The size of total trade, total imports and imports from low- and high-income economies, respectively, as ratios of GDP are alternately used as the explanatory variables. Since these trade variables are likely to be endogenous, this study employed a set of constructed export and import instruments, respectively.

In contrast with the popular belief about job robbing, this study found that only imports from high-income economies are likely to increase aggregate unemployment,

when the direct effect of trade is considered. However, there is no clear evidence that other trade variables such as total trade, total imports, or imports from low-income economies have any significant effect on unemployment. When the interaction between the trade variables and different labour market institutions, which is likely to be more correct, is specified, there is substantially robust evidence that the role of the country's labour market institution is important for identifying the effect of trade on unemployment. In particular, an increase in trade leads to high (low) aggregate unemployment as it interacts with relatively rigid (flexible) employment protection, generous unemployment benefits, strong unions, as well as centralised wage bargaining.

Given the limitation of the labour market institution indices and the macroeconomic data, the findings in this study are a mere description of the pattern for how the size of international trade can be related to aggregate unemployment in the presence of different labour market institutions. Moreover, another issue of endogeneity in labour market institutions remains. In particular, Agell (2002) and Kim (2006) argued that a country's exposure to an international shock is closely related to how extensive the country's labour market institutions become. The current study attempted to alleviate the potential endogeneity of labour market institutions by using the initial value of the institutions. However, identifying how international trade, labour market institutions, and unemployment are intercorrelated remains a challenging topic for future study.

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Appendix A Figures and Tables

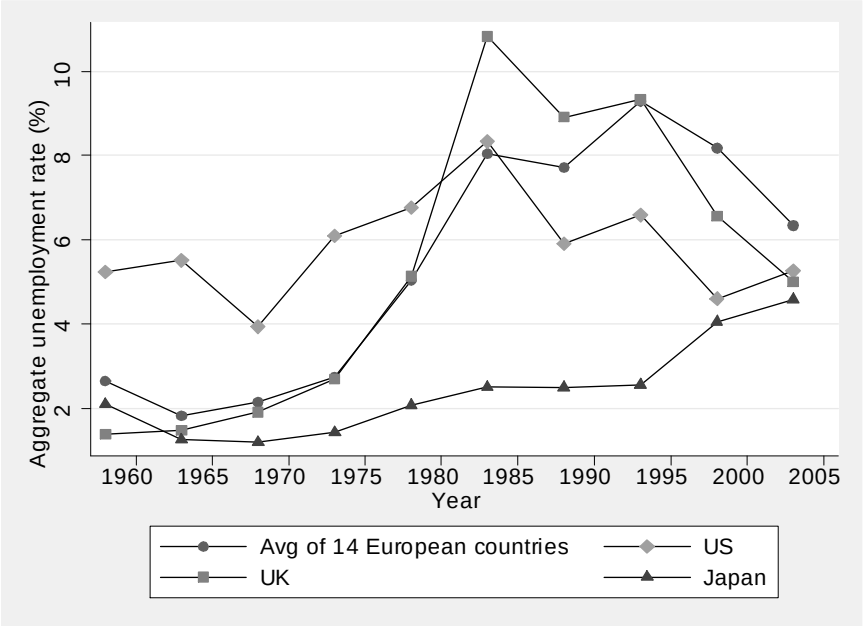

Figure 1: The development of the aggregate unemployment rate in the selected countries.

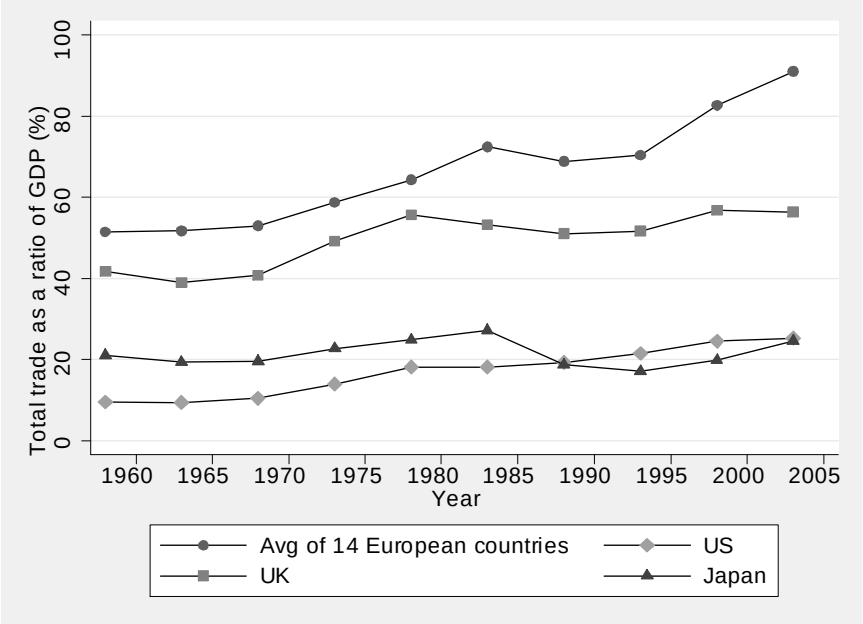

Figure 2: The development of total trade as a ratio of GDP in the selected countries.

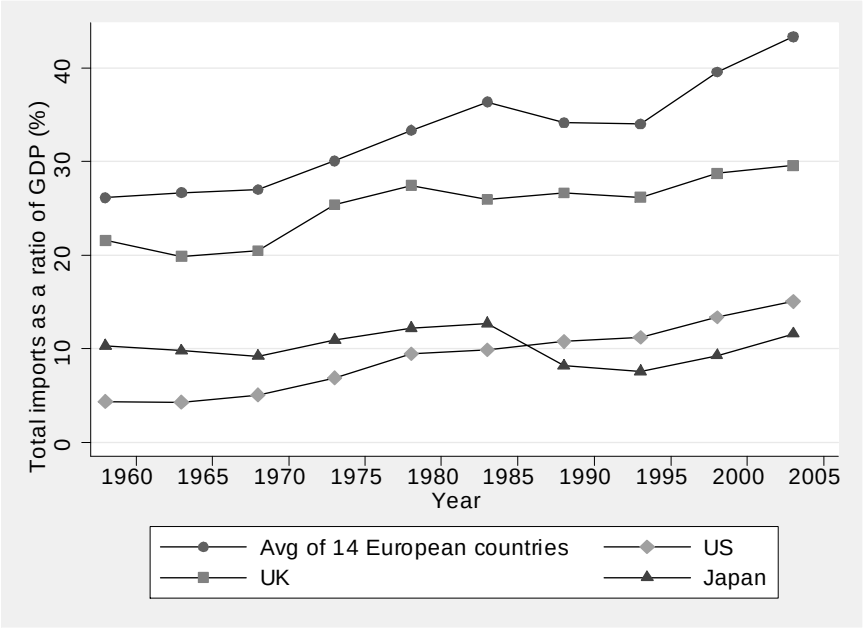

Figure 3: The development of total imports as a ratio of GDP in the selected countries.

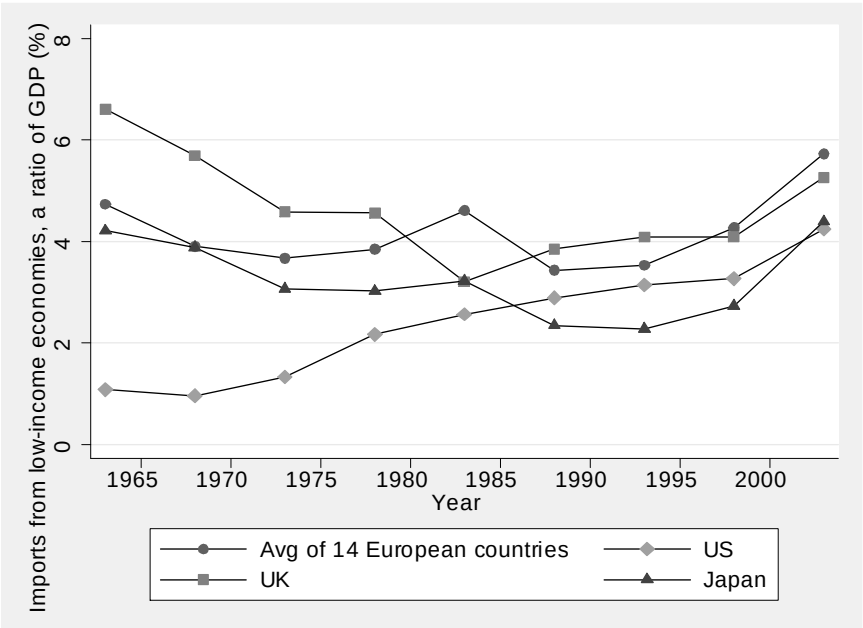

Figure 4: The development of imports from low-income economies as a ratio of GDP. *Note*: The low-income economies are defined as all countries except the OPEC and the OECD member countries.

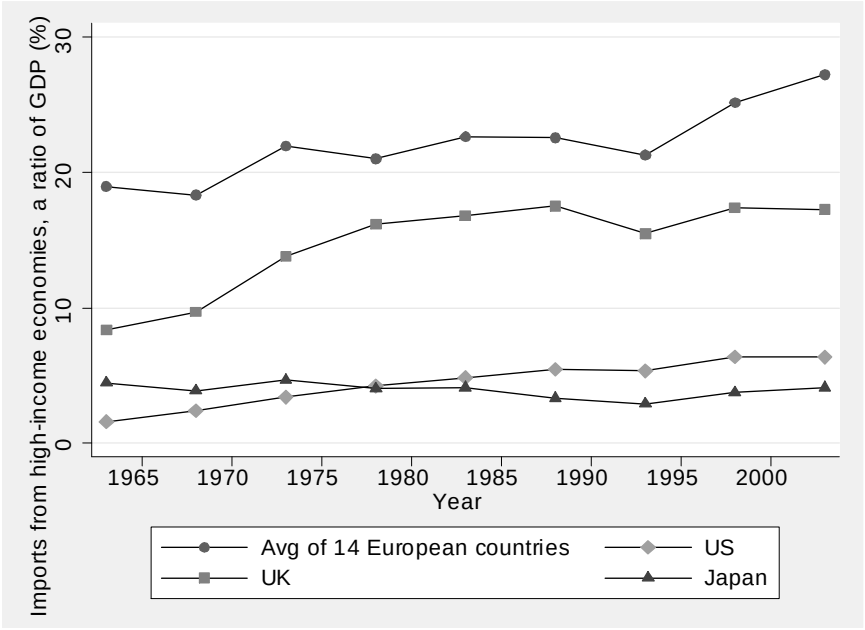

Figure 5: The development of imports from high-income economies as a ratio of GDP. *Note*: The high-income economies are defined as the OECD member countries.

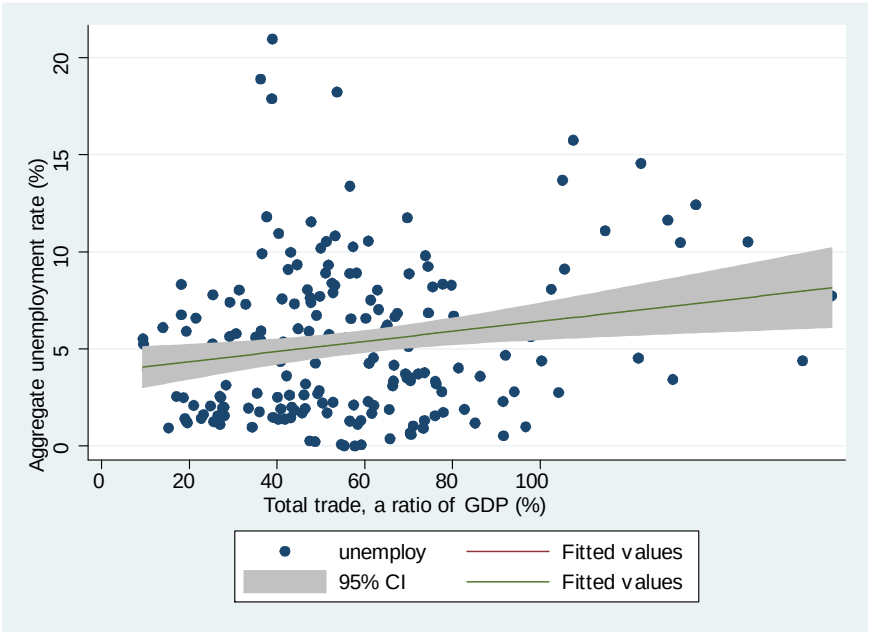

Figure 6: The scatter graph between total trade as a ratio of GDP and the aggregate unemployment rate.

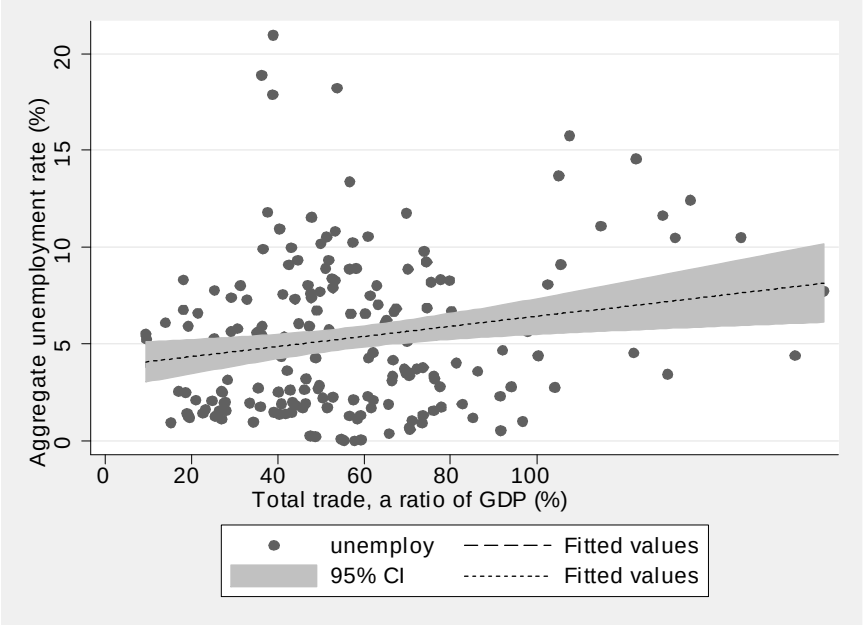

Figure 7: The scatter graph between imports from low-income economies as a ratio of GDP and the aggregate unemployment rate.

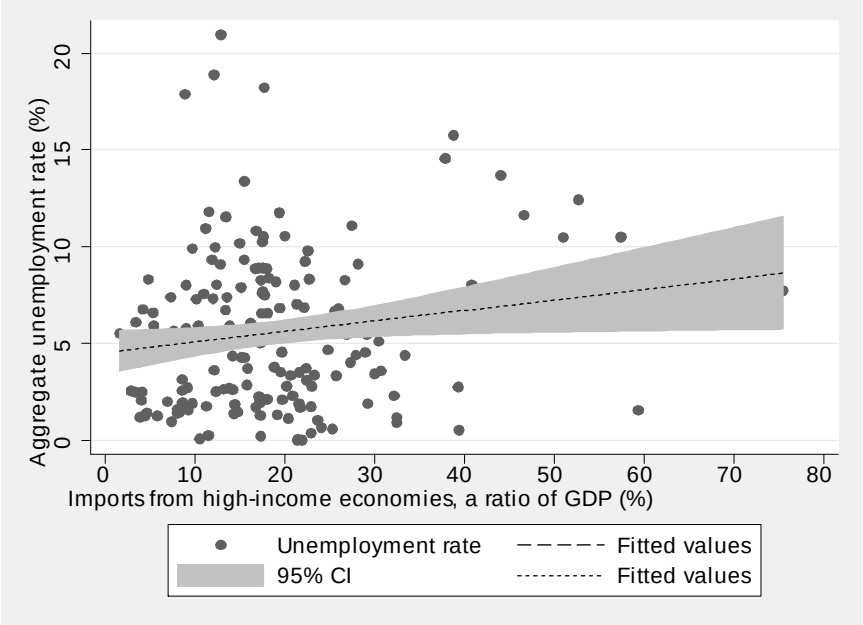

Figure 8: The scatter graph between imports from high-income economies as a ratio of GDP and the aggregate unemployment rate.

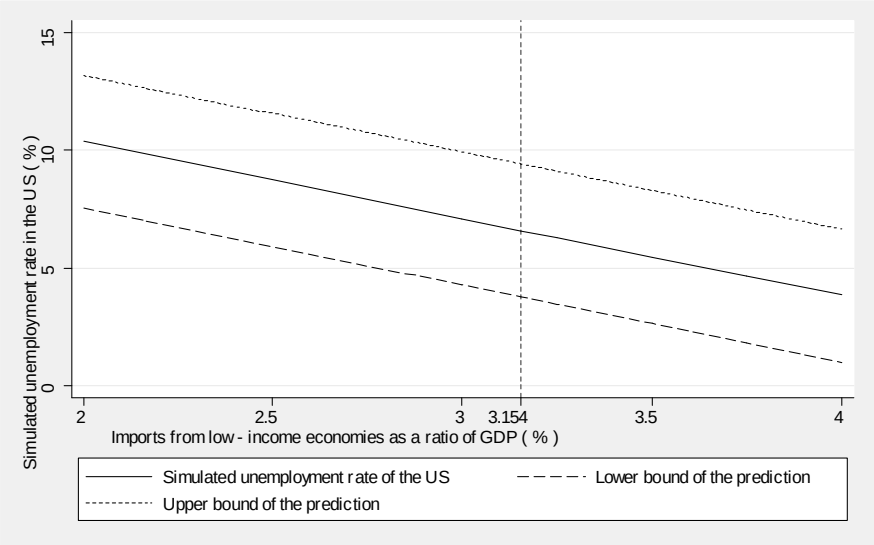

Figure 9: Simulation of an unemployment rate for the U.S. for the years 1991-1995 as imports from low-income economies vary as a ratio of GDP. The stringency of employment protection is controlled for.

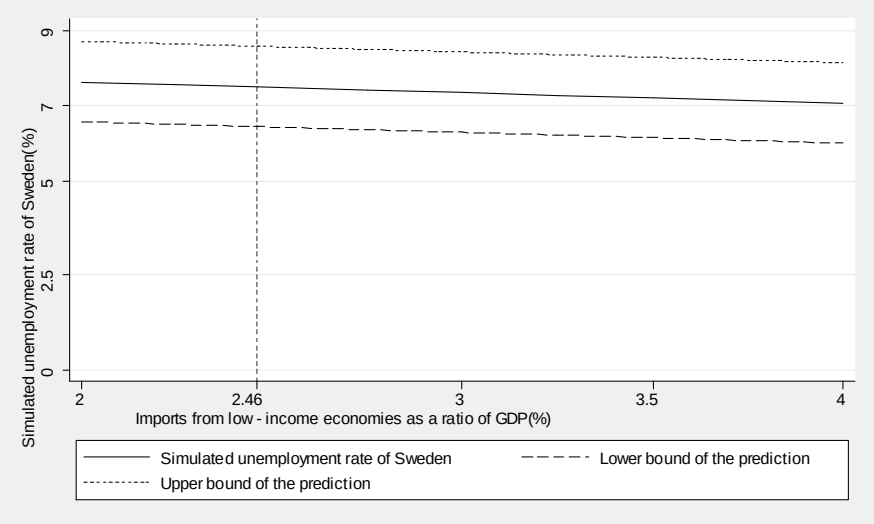

Figure 10: Simulation of an unemployment rate for Sweden for the years 1991-1995 as imports from low-income economies vary as a ratio of GDP. The stringency of employment protection is controlled for.

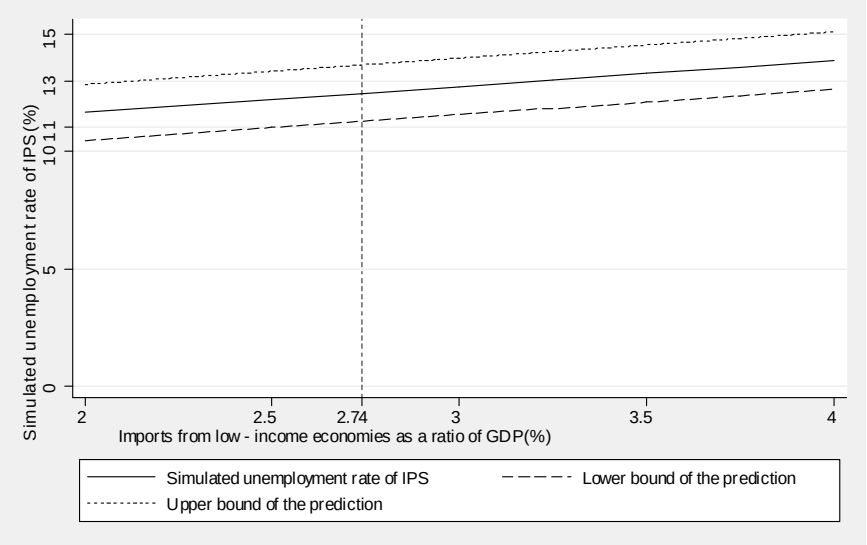

Figure 11: Simulation of an unemployment rate for the average of Italy, Portugal, and Spain (IPS) for the years 1991-1995 as imports from low-income economies vary as a ratio of GDP. The stringency of employment protection is controlled for.

Table 1: The Summary Statistics

R.H.S. variable	# Obs	Mean	Std. dev.	Min	Max
Unemployment	200	5.244	3.915	0.007	20.955
L.H.S. variables					
Total trade♦	196	58.048	29.789	9.439	166.460
Total imports♦	195	28.998	14.277	4.295	81.294
Imports from low-income countries♦	179	3.916	1.813	0.961	11.845
Imports from high-income countries♦	179	18.818	11.514	1.577	75.444
Employment protection	197	0.636	0.380	0	1.394
Unemployment benefits	200	24.052	13.763	0	61.02
Net union density	182	41.127	18.364	8.44	85.78
Coordination in wage bargaining	180	2.150	0.607	1	3
gdp per capita	197	13.154	12.361	0.357	62.534
total population	200	36314.75	53739.43	2258.833	293273
share of population between 15-64	200	65.089	2.684	57.613	69.946

♦ as a ratio of GDP.

Table 2: The Covariance Matrix for panel data

Correlation	UNEMPLOY	*tottrade*	*totimport*	*importhigh*	*importlow*
UNEMPLOY	1	0.445***	0.442***	0.300**	0.052
tottrade		1	0.978***	0.578**	0.427**
totimport			1	0.668***	0.441***
importhigh				1	0.403***
importlow					1

This table is the correlation coefficient of the fixed-effects model of the panel data. Standard errors are corrected for clustering at the country level . *** and ** denote that the correlation coefficient is significant at the 1% and 5% level, respectively.

Table 3: The IV estimation for the effect of trade on unemployment with employment protection

with epl	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
R.H.S.	trade=tottrade		trade=totimport		trade=importlow		trade=importhigh	
epl	-2.835	-10.042	-4.299	-10.642	-1.740	-12.762	-7.315	-9.202
	(-0.77)	(-3.06)***	(-1.01)	(-3.09)**	(-0.47)	(-4.12)***	(-2.16)**	(-2.55)**
trade	-0.013	-0.092	0.158	-0.211	-4.515	-1.382	0.576	-0.160
	(-0.08)	(-0.94)	(0.40)	(-1.46)	(-1.10)	(-1.33)	(1.97)**	(-1.37)
(trade)*epl		0.170		0.362		3.336		0.408
		(4.10)***		(4.37)***		(4.82)***		(3.17)***
gdpc	-0.369	-0.368	-0.300	-0.373	-.4702	-0.297	-0.036	-0.378
	(-2.29)**	(-2.69)***	(-1.57)	(-2.69)***	(-1.79)*	(-2.08)**	(-0.18)	(-2.60)***
populshare1564	-0.163	0.070	-0.287	0.033	0.410	0.274	-0.279	-0.181
	(-0.52)	(0.35)	(-0.93)	(0.20)	(0.73)	(1.16)	(-1.13)	(-1.06)
IV	yes	yes	yes	yes	yes	yes	yes	yes
1-stg F-stat	53.37	529.70/6305.80	51.82	1301.62/4889.28	8.25	15.08/645.04	46.64	329.35/3581.00
Hansen J-stat	2.133	2.038	2.927§	2.487	0.556	0.023	0.924	1.965
# obs.	156	156	156	156	157	157	157	157

Note: The dependent variable is the unemployment rate. The IV-regressions use the constructed instruments, *exportinstr* and *importinstr*. The numbers in parentheses are t-values. Standard errors are clustered by country. ***, **, and * denote a significance of 1%, 5%, and 10%, respectively. 1-stg F-stat and Hansen J-stat are the F-statistic of the first-stage regression and the Hansen overidentification test of all instruments, respectively. *epl* is centred. *trade* and *(trade)*epl* indicates the coefficient estimate of the respective trade variable and the interaction term between epl and the respective trade variable. The trade variables and their interaction with epl are instrumented by the constructed instruments, *exportinstr*, *importinstr*, *epl60exportinstr*, and *epl60importinstr*, which are the product of the value of the initial epl, *epl60*. The first and the second value of 1stg F-stat in column (2) are the F-statistics of the first-stage regressions for the trade variables and the interaction terms, respectively. § denotes that Hansen's J-statistic is significant at the 10% level.

Table 4: The IV estimation for the effect of trade on unemployment with unumployment benefit

with brr	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
R.H.S.	trade=tottrade		trade=totimport		trade=importlow		trade=importhigh	
brr	0.018	-0.715	0.025	-0.690	-0.073	-0.673	0.028	-0.337
	(0.43)	(-2.05)**	(0.55)	(-1.66)*	(-0.63)	(-1.19)	(0.55)	(-1.76)*
trade	0.045	-0.414	0.225	-0.787	-2.980	-2.483	0.404	-0.423
	(0.33)	(-1.37)	(0.91)	(-1.24)	(-1.04)	(-1.23)	(2.23)**	(-1.25)
(trade)*brr		0.012		0.023		0.161		0.018
		(2.24)**		(1.83)*		(1.13)		(2.08)**
gdpc	-0.274	-0.796	-0.215	-0.751	-0.376	-0.303	-0.068	-0.615
	(-1.66)*	(-2.06)**	(-1.21)	(-1.94)*	(-1.73)*	(-1.03)	(-0.38)	(-2.43)**
populshare1564	-0.142	0.046	-0.190	-0.766	0.350	0.098	-0.80	-0.178
	(-0.61)	(0.13)	(-0.85)	(-0.26)	(0.81)	(0.20)	(-0.37)	(-0.93)
IV	yes	yes	yes	yes	yes	yes	yes	yes
1-stg F-stat	22.99	803.23/3373.13	16.80	829.15/2798.80	6.20	5.51/8638.77	21.70	590.29/8049.14
Hansen J-stat	2.629	0.649	2.561	0.059	1.181	0.504	1.201	1.431
# obs.	158	158	158	158	159	159	159	159

Note: See note in Table 3. *brr* is centred. The interaction between *trade* and *brr* is instrumented by the constructed instruments, *exportinstr*, *importinstr*, *brr60exportinstr*, and *brr60importinstr*, which are the product of the value of the initial brr, *brr60*.

Table 5: The IV estimation for the effect of trade on unemployment with net union density

with udnet	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
R.H.S.	trade=tottrade		trade=totimport		trade=importlow		trade=importhigh	
udnet	0.017	-0.595	-0.002	-0.379	0.138	-0.293	-0.006	-0.023
	(0.32)	(-1.35)	(-0.04)	(-0.93)	(1.06)	(-2.17)**	(-0.11)	(-0.10)
trade	0.060	-0.380	0.266	-0.250	-0.745	-1.515	0.412	0.179
	(0.45)	(-1.05)	(1.15)	(-0.60)	(-0.99)	(-1.60)	(2.38)**	(0.95)
(trade)*udnet		0.013		0.015		0.086		0.010
		(1.45)		(0.97)		(2.65)***		(0.18)
gdpc	-0.199	-0.591	-0.128	-0.372	-0.471	-0.319	-0.006	-0.146
	(-1.27)	(-1.31)	(-0.82)	(-1.55)	(-1.78)*	(-2.92)***	(-0.04)	(-1.20)
populshare1564	-0.121	1.248	-0.194	0.546	0.741	0.221	-0.023	-0.027
	(-0.45)	(1.00)	(-0.77)	(0.77)	(0.99)	(0.86)	(-0.12)	(-0.17)
IV	yes	yes	yes	yes	yes	yes	yes	yes
1-stg F-stat	13.58	257.45/165.09	14.91	387.46/303.64	7.53§	24.81/1031.44	11.56	345.79/1031.44
Hansen J-stat	2.571	0.286	2.344	1.062	0.803	2.354	0.975	3.121
# obs.	148	148	148	148	148	148	148	148

Note: See note in Table 3. *udnet* is centred. The interaction between *trade* and *udnet* is instrumented by the constructed instruments, *exportinstr*, *importinstr*, *udnet60exportinstr*, and *udnet60importinstr*, which are the product of the value of the initial udnet, *udnet60*. § denotes that Hansen's J-statistic is significant at the 10% level.

Table 6: The IV estimation for the effect of trade on unemployment with centralisation in wage bargaining

with cow	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
R.H.S.	trade=tottrade		trade=totimport		trade=importlow		trade=importhigh	
cow	-0.850	-6.700	-1.381	-5.402	1.749	-1.385	-2.808	-5.477
	(-0.66)	(-1.70)*	(-0.90)	(-1.74)*	(0.85)	(-0.59)	(-1.68)*	(-2.06)**
trade	-0.037	-0.230	0.092	-0.249	-3.125	-1.503	0.528	-0.088
	(-0.24)	(-1.51)	(0.24)	(-0.91)	(-1.67)*	(-1.80)*	(1.95)*	(-0.48)
(trade)*cow		0.103		0.149		0.393		0.218
		(1.65)*		(1.60)		(0.81)		(1.81)*
gdpc	-0.323	-0.376	-0.255	-0.350	-0.378	-0.331	0.034	-0.270
	(-1.93)*	(-2.18)**	(-1.22)	(-1.98)**	(-1.78)*	(-2.05)**	(0.17)	(-1.71)*
populshare1564	0.034	0.157	-0.011	0.063	0.197	0.134	0.157	-0.024
	(0.17)	(0.66)	(-0.06)	(0.31)	(0.65)	(0.76)	(0.64)	(-0.01)
IV	yes	yes	yes	yes	yes	yes	yes	yes
1-stg F-stat	34.72	289.08/2544.92	14.13	186.44/3483.94	3.99	31.28/153.32	9.98	78.44/2119.56
Hansen J-stat	2.061	1.724	2.961§	2.506	0.538	2.288	1.533	1.698
# obs.	158	158	158	158	159	159	159	159

Note: See note in Table 3. *cow* is centred. The interaction between *trade* and *cow* is instrumented by the constructed instruments, *exportinstr*, *importinstr*, *cow60exportinstr*, and *cow60importinstr*, which are the product of the value of the initial cow, *cow60*. § denotes that Hansen's J-statistic is significant at the 10% level.

Table 7: The summary of the sign of the coefficient estimates

α	θ	if $\left(LMI_{it} - \overline{LMI}\right)$	$\frac{\partial(unemploy)}{\partial(trade)}$
mostly 0	(+)	(+); rigid	(+)
		0; average	0
		(–); flexible	(–)

Note: This table summarises the signs of the coefficient estimates of the baseline specification (2). α_{it} and θ_{it} indicate the constituent effect and the interaction effect of trade, respectively. $\frac{\partial(unemploy)}{\partial(trade)}$ is the total effect of trade on the aggregate unemployment rate.

Table 8: Sensitivity Analysis of the Unemployment Regression with Employment Protection and Trade Variables

	(1)	(2)	(3)	(4)	(5)	(6)
R.H.S.	A. trade=tottrade					
epl	-1.908	-6.696	-6.126	-19.303	-9.350	-8.035
	(-0.83)	(-1.72)*	(-2.22)**	(-3.53)***	(-2.74)***	(-2.69)***
trade	0.008	0.007	-0.023	-0.003	0.050	-0.072
	(0.40)	(0.55)	(-0.53)	(-0.06)	(0.75)	(-0.82)
trade*epl		0.098		0.243	0.116	0.162
		(2.32)**		(3.01)***	(3.52)***	(4.04)***
gdpc	-0.235	-0.197	-0.265	-0.187		-0.337
	(-2.51)**	(-2.51)**	(-2.49)**	(-1.87)*		(-3.43)***
populshare1564	-0.167	-0.088	0.005	-0.025	-0.021	0.212
	(-1.23)	(-0.65)	(0.02)	(-0.09)	(-0.10)	(1.08)
IV	no	no	yes	yes	yes	yes
(within)-R^2	0.653	0.677				
1-stg F-stat.	-		17.30	127.55/506.33	221.6/3582.43	439.12/5047.52
Hansen J-stat.	-		3.629	5.747	2.343	2.017
# obs.	192	192	120	120	156	142
Note	OLS	OLS	additional IV	additional IV	no gdpc	no Prt, Esp

Table 8 continued

	(1)	(2)	(3)	(4)	(5)	(6)
R.H.S.				B. trade=totimport		
epl	-1.781	-7.139	-6.170	-19.943	-9.126	-8.374
	(-0.78)	(-1.77)*	(-2.24)**	(-3.38)***	(-2.62)***	(-2.78)***
trade var.	-0.002	-0.023	-0.026	0.000	0.083	-0.155
	(-0.05)	(-0.71)	(-0.22)	(0.00)	(0.76)	(-1.22)
trade*epl		0.219		0.490	0.221	0.335
		(2.48)**		(2.92)***	(2.91)***	(4.42)***
gdpc	-0.239	-0.201	-0.261	-0.183		-0.330
	(-2.64)**	(-2.62)**	(-2.20)**	(-1.75)*		(-3.62)***
populshare1564	-0.154	-0.079	-0.032	-0.121	-0.018	0.160
	(-1.16)	(-0.59)	(-0.10)	(-0.43)	(-0.11)	(1.08)
IV	no	no	yes	yes	yes	yes
(within)-R^2	0.653	0.680				
1-stg F-stat.			12.55	172.39/865.76	619.10/3161.28	1221.87/3288.16
Hansen J-stat.			3.658	5.488	2.307	2.397
# obs.	192	192	120	120	156	142

Table 8 continued

	(1)	(2)	(3)	(4)	(5)	(6)
R.H.S.	C. trade=importlow					
epl	-2.176	-7.181	-6.246	-19.588	-14.733	-11.155
	(-1.08)	(-2.91)***	(-2.18)**	(-3.52)***	(-4.03)***	(-4.47)***
trade	-0.295	-0.280	0.147	-0.013	0.110	-0.916
	(-1.97)*	(-1.59)	(0.17)	(-0.02)	(0.15)	(-1.13)
trade*epl		1.634		4.953	3.903	3.486
		(3.37)***		(2.98)***	(4.39)***	(5.36)***
gdpc	-0.234	-0.210	-0.247	-0.242		-0.224
	(-2.73)**	(-2.74)**	(-1.91)*	(-2.74)***		(-3.04)***
populshare1564	-0.130	-0.034	-0.086	0.081	0.276	0.433
	(-1.05)	(-0.27)	(-0.23)	(0.30)	(1.62)*	(2.20)**
IV	no	no	yes	yes	yes	yes
(within)-R^2	0.666	0.699				
1-stg F-stat.			17.61	122.04/296.05	5.93/780.65	27.55/815.13
Hansen J-stat.			4.707	6.332	1.099	0.212
# obs.	177	177	120	120	157	143

Table 8 continued

	(1)	(2)	(3)	(4)	(5)	(6)
R.H.S.	D. trade=importhigh					
epl	-2.228	-4.690	-6.354	-13.735	-7.664	-6.530
	(-1.08)	(-1.24)	(-2.42)**	(-2.12)**	(-2.12)**	(-2.03)**
trade var.	0.025	0.000	0.028	-0.111	0.044	-0.101
	(1.30)	(0.01)	(0.14)	(-0.64)	(0.53)	(-0.84)
trade*epl		0.144		0.397	0.250	0.352
		(1.17)		(1.45)	(2.23)**	(2.72)***
gdpc	-0.204	-0.200	-0.239	-0.245		-0.314
	(-2.30)**	(-2.35)**	(-1.35)	(-1.90)*		(-3.29)***
populshare1564	-0.145	-0.169	-0.070	-0.219	-0.024	-0.021
	(-1.17)	(-1.15)	(-0.23)	(-0.84)	(-0.16)	(-0.13)
IV	no	no	yes	yes	yes	yes
(within)-R^2	0.659	0.666				
1-stg F-stat.			29.47	276.58/3734.91	126.19/2644.87	439.12/5047.54
Hansen J-stat.			4.139	4.693	1.902	2.032
# obs.	177	177	120	120	157	143

Note: The dependent variable is the unemployment rate. All regressions include fixed effects for time and countries. The numbers in parentheses are t-values. Standard errors are clustered-robust by country. ***, **, and * denote a significance of 1%, 5%, and 10%, respectively. F-stat and Hansen J-stat are the F-statistic of the first-stage and the Hansen overidentification test of all instruments, respectively. The first and second value of F-statatistics are the F-statistics of the first-stage regressions for the trade variables and the interaction terms, respectively. Hansen J-stat is the Hansen overidentification test result of all instruments. The trade variables and the interaction term are, in general, instrumented by the constructed export/import instruments and the product of the value of the initial *epl60* and the constructed export- and import-instrument.

Appendix B Description of Data

- *unemploy* (%): rate of aggregate unemployed as a share of the civilian labour force. 1956-2007. Source: OECD Annual labour Force Statistics (ALFS).

- *tottrade*: sum of total exports and imports as a ratio of GDP, expressed as a percentage. Source: World Development Index (WDI).

- *totimport*: total imports of goods and services as a ratio of GDP, expressed as a percentage. Source: WDI.

- *importlow*: a country's imports from low-income economies as a ratio of GDP, expressed as a percentage. The low-income economies are defined as all countries except the OECD and the OPEC member countries of that year. The disaggregated bilateral import data are summed. Source: COMTRADE.

- *importhigh*: a country's imports from high-income economies as a ratio of GDP, expressed as a percentage. The high-income economies are the OECD member countries. The disaggregated bilateral import data are summed. Source: COMTRADE.

- *epl*: employment protection legislation data from the OECD labour market statistics database using version 1 of the indicator. Range is [0,2] increasing with the strictness of employment protection. Source: The CEP_OECD Institutions data set.

- *brr*: unemployment benefit replacement rate data published by the OECD. It is defined as the average across the first five years of unemployment for three family situations and two money levels and interpolated. Source: The CEP_OECD Institutions data set.

- *udnet* (%): net union density extended by Visser. This is union membership as a share of employment calculated using administrative and survey data from the OECD labour market statistics database. It is extended by splicing in data from Visser. Source: The CEP_OECD Institutions data set.

- *cow*: index of bargaining coordination with a range [1,3] taken from Ochel (2000). It is based on the data reported in OECD (1994, 1997), Traxler and Kittel (1999), Wallerstein (1999), Windmuller et al. (1987), and Bamber and Lansbury (1998). It is interpolated by Nickell and Nunziata. Source: The CEP_OECD Institutions data set.

- *gdpc*: real gross domestic product per capita in current US $, 1960-2008 Source: World Development Index.

- *gdp_wdi*: gross domestic product in current US $, unit, 1960-2008. Source: World Development Index.
- *populshare1564*: population aged between 15 and 64 as a share of total population. 1955-2007. Source: ALFS-OECD.
- *popul*: total population in thousands, 1955-2008 Source: ALFS-OECD.